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Committee of Experts on the Transport of Dangerous Goods and on the Globally Harmonized System of Classification and Labelling of Chemicals

Sub-Committee of Experts on the Transport of Dangerous Goods

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Geneva, 23 June – 2 July 2014
Item 5 (e) of the provisional agenda
Electric storage systems: miscellaneous

Report on the second meeting of the informal working group on testing large lithium batteries

Transmitted by the expert from France (in his capacity as Chairman of the informal working group), PRBA, RECHARGE and COSTHA[1]

1. The informal working group meeting was held in Brussels on 11 February 2014. It was co-organized by RECHARGE, PRBA and COSTHA. A total of 40 participants from both the Sub-Committee of Experts on the Transport of Dangerous Goods (TDG) and industry attended the meeting. The expert from France, Claude Pfauvadel, chaired the meeting.

2. A detailed report of the discussions, proposals and list of participants are available on RECHARGE's website:

http://www.rechargebatteries.org/knowledge-base/transport/

3. Below is a summary of the proposed changes to the Manual of Tests and Criteria that were generally agreed to during the working group meeting for consideration by the Sub-Committee. These changes are also reflected in the annex to this document. The proposal for amendments was reviewed at the end of the working group meeting; however, some comments were received later by email. They have been included in the text in square brackets.

[1] In accordance with the programme of work of the Sub-Committee for 2013-2014 approved by the Committee at its sixth session (refer to ST/SG/AC.10/C.3/84, para. 86 and ST/SG/AC.10/40, para. 14).

4. The Sub-Committee is invited to check the possibility of adopting these proposals keeping in mind that, if necessary, a further review may be done during the next session of the working group.

Reporting

5. In addition to the quality control system required by section 2.9.4 of the Model Regulations, there was a general agreement among the working group participants that a standard reporting form for lithium metal and lithium ion cells and batteries testing reports section 38.3 of the Manual of Tests and Criteria should be considered for incorporation into the Model Regulations.

Definitions (para. 38.3.2.3)

6. There are changes related to definitions in or clarifications of these definitions. It was confirmed that the common language that includes the terms "battery packs, battery modules, battery assembly, battery systems" should fall under the single term "battery." The term "battery assembly" was removed in an effort to avoid confusion over the use of this term. The term "assembled batteries" appeared to be more appropriate.

T5 short circuit Test (para. 38.3.4.5.2)

7. The ability to conduct the short circuit test outside the heating chamber was discussed. An agreement was reached on a more accurate description of the heating duration and the possibility to reduce the cooling phase for large batteries.

T4 shock test (para. 38.3.4.4)

8. The testing requirements for large batteries were discussed at length but it was agreed that additional information and modifications to the proposals were required before making a decision. The subject will be prepared for the next meeting.

T7 Overcharge (para. 38.3.4.5.2)

9. Clarification has been proposed in the text regarding the application of the overcharge test.

Battery assembly testing (para. 38.3.3)

10. Paragraph (f) was amended to remove the word "assembly." A new paragraph (g) has been proposed to apply to the current paragraph at the end of 38.3.3, which currently has no letter associated with it. In addition, the new paragraph (g) was amended to clarify the applicable requirements.

Aggregate lithium content

11. The working group confirmed that the definition of Lithium content makes a clear distinction between the lithium metal and the lithium rechargeable batteries; therefore, there is no need to amend the definition of the aggregate lithium content.

12. It was agreed that a third meeting of the informal working group will be held in Washington DC from 29 September to 2 October 2014 to finalize the proposed changes to Chapter 38.3.

Annex

Proposed amendments to section 38.3 in Amend.1 to the 5th revised edition of the Manual of Tests and Criteria

38.3.2.1 Amend to read as follows:

"All cell types shall be subjected to test T.1 to T.6 and T.8. All non-rechargeable battery types, including those composed of previously tested cells, shall be subjected to tests T.1 to T.5. All rechargeable battery types, including those composed of previously tested cells, shall be subjected to tests T.1 to T.5 and T.7. In addition, rechargeable single cell batteries with overcharge protection shall be subjected to test T.7. A component cell that is not transported separately from the battery it is part of the needs only to be tested according to tests T.6 and T.8. A component cell that is transported separately from the battery shall be subjected to tests T.1 to T.6 and T.8.".

38.3.2.3 Amend the definitions hereafter to read as follows:

"*Cell* means a single encased electrochemical unit (one positive and one negative electrode) which exhibits a voltage differential across its two terminals, and may contain **its** protection devices. ~~[Under the Model Regulations and this Manual, to the extent the encased electrochemical unit meets the definition of a "cell" herein, it is a "cell", not a "battery", regardless of whether the unit is termed a "battery" or a "single cell battery" outside of the Model Regulations and this Manual.]~~ See definitions for battery and single cell battery.".

"*Component cell* means a cell contained in a battery. A component cell is not to be considered a single cell battery.".

"*Battery* means two or more cells or batteries which are electrically connected together and fitted with devices necessary for use, for example, case, terminals, marking ~~and~~ or protective devices. ~~A single cell battery is considered a "cell" and shall be tested according to the testing requirements for "cells" for the purposes of the Model Regulations and this Manual (see also the definition for "cell").~~ ~~Note:~~ Units which have 2 or more cells that are commonly referred to as "battery packs", "modules" or "battery assemblies" having the primary function of providing a source of power to another piece of equipment are for the purposes of the Model Regulations and this Manual treated as batteries. See definitions for cell and single cell battery.".

"*Single cell battery* means a cell ~~single electrochemical unit~~ [externally] fitted with devices necessary for use in equipment or another battery which it is designed to power, for example~~, case, terminals, marking and~~ protective devices. See definitions for cell and battery.

***NOTE**: A single cell battery is considered a "cell" and shall be tested according to the testing requirements for "cells" for the purposes of the Model Regulations and this Manual.".*

38.3.3 (d) Amend the last paragraph to read as follows:

"Batteries or single cell batteries not equipped with battery overcharge protection that are designed for use only as a component in another battery [or equipment] ~~assembly~~, which affords such protection, are not subject to the requirements of this test.".

38.3.3 (f) Amend to read as follows:

"(f) When testing a battery ~~assembly~~ in which the aggregate lithium content of all anodes, when fully charged, is not more than 500 g, or in the case of a lithium ion battery, with a Watt-hour rating of not more than 6200 Watt-hours, that is assembled from batteries [or single cell batteries] that have passed all applicable tests, one assembled battery ~~assembly~~ in a fully charged state shall be tested under tests T.3, T.4 and T.5, and, in addition, test T.7 in the case of a rechargeable battery ~~assembly~~. ~~For a~~A rechargeable battery ~~assembly, the assembly~~ shall have been cycled at least 25 cycles.".

38.3.3 (g) Amend to read as follows:

"(g) When batteries [or single cell batteries] that have passed all applicable tests are electrically connected to form a battery ~~assembly~~ in which the aggregate lithium content of all anodes, when fully charged, is more than 500 g, or in the case of a lithium ion battery, with a Watt-hour rating of more than 6200 Watt-hours, ~~that~~ the assembled battery ~~assembly~~ does not need to be tested if:

(i) It is designed with a battery management system that has been demonstrated to ensure that the battery will never be subject to overcharge, and

(ii) The assembled battery is be equipped with a system capable of ~~monitoring the battery assembly and~~ preventing short circuits or over discharge between the batteries ~~and any overheat or overcharge in the battery assembly~~.".

38.3.4.5.2 Amend to read as follows:

"The cell or battery to be tested shall be heated to reach an homogenous stabilized temperature of ~~stabilized so that its external case temperature reaches~~ 57 °C ±4 °C ,measured on the external case. The time for achieving a stabilized temperature shall be assessed and documented depending on its size and design of the cell or battery. If this assessment is not feasible, the exposure time shall be at least [6]hours for small cells and small batteries, and [12] hours for large cells and large batteries. Then the cell or battery at 57 °C ±4 °C shall be subjected to ~~a~~ one short circuit condition with a total external resistance of less than 0.1 ohm ~~at 55 ±2 oC~~.

This short circuit condition is continued for at least one hour after the cell or battery external case temperature has returned to 57 °C ±4 °C, or in the case of the large batteries, has decreased of half of the maximum increase observed during the test, provided the temperature during the cooling phase has been steadily decreasing [not re-increased of more than 5°C].".

38.3.4.7.1 Amend to read as follows:

"This test evaluates the ability of a rechargeable battery or a single cell rechargeable battery to withstand an overcharge condition.".